Trade and Growth in Sub-Saharan Africa: Further Empirical Evidence

African Economic Policy
Discussion Paper Number 64
May 2001
Malcolm F. McPherson
Tzvetana Rakovski
Belfer Center for Science & International Affairs
John F. Kennedy School of Government, Harvard University

Funded by
United States Agency for International Development
Bureau for Africa
Office of Sustainable Development
Washington, DC 20523-4600

Equity and Growth through Economic Research

EAGER supports economic and social science policy analysis in Sub-Saharan Africa. Its primary goal is to increase the availability and the use of policy analysis by both public and private sector decision-makers. In addition to the goal of achieving policy reform, EAGER seeks to improve the capacity of African researchers and research organizations to contribute to policy debates in their countries. In support of this goal, EAGER sponsors collaboration among American and African researchers and research organizations.

EAGER is implemented through two cooperative agreements and a communications logistics contract financed by the United States Agency for International Development (USAID), Strategic Analysis Division, The Office of Sustainable Development, Bureau for Africa. A consortium led by the Harvard Institute for International Development (HIID) holds the cooperative agreement for Public Strategies for Growth and Equity. Associates for International Resources and Development (AIRD) leads the group that holds the cooperative agreement for Trade Regimes and Growth. The Communications Logistics Contract (CLC) is held by a consortium led by BHM International, Inc. (BHM). Other capacity-building support provides for policy analysis by African institutions including the African Economic Research Consortium, Réseau sur Les Politiques Industrielles (Network on Industrial Policy), Programme Troisième Cycle Interuniversitaire en Economie, and the International Center for Economic Growth. Clients for EAGER research activities include African governments and private organizations, USAID country missions and USAID/Washington, and other donors.

For information contact:

Yoon Lee, Project Officer
USAID
AFR/SD/SA (4.06-115)
Washington, D.C. 20523
Tel: 202-712-4281 Fax: 202-216-3373
E-mail: ylee@usaid.gov

Lisa M. Matt, Senior Advisor
BHM International
P.O. Box 3415
Alexandria, VA 22302
Tel: 703-299-0650 Fax: 703-299-0651
E-mail: lmatt@eagerproject.com
Contract AOT-0546-Q-00-5271-00

Carrie Main, Project Administrator
Belfer Center for Science & International Affairs
John F. Kennedy School of Government
Harvard University
79 John F. Kennedy Street
Cambridge, MA 02138
Tel: 617-496-0112 Fax: 617-496-2911
E-mail: carrie_main@harvard.edu
Contract AOT-0546-A-00-5133-00

J. Dirck Stryker, Chief of Party
Associates for International
Resources and Development (AIRD)
185 Alewife Brook Parkway
Cambridge, MA 02138
Tel: 617-864-7770 Fax: 617-864-5386
E-mail: dstryker@aird.com
Contract AOT-0546-A-00-5073-00

Abstract

This study looks at the interaction between income growth and trade. A simultaneous equations model is used that includes real income growth, trade share, the growth rate of real investment; changes in the exchange rate, and the inflation rate as endogenous variables. The model accounts for the simultaneity among the key variables and allows for direct and indirect effects between trade and income growth. It also makes possible the investigation of other relevant variables relevant to the trade-growth relationship. The lagged values in the model provide a means of testing for inter-temporal effects and causality. The model is estimated with data from 33 African countries over a period of 29 years (1970 to 1998). The coefficients of the structural equations are derived using a dynamic panel general method of moments (GMM) estimator, which gives consistent estimates in the presence of endogenous regressors, lagged endogenous variables, and regressors correlated with country effects. For comparison purposes, the study also derives three-stage least squares (3SLS) estimates. As a means of linking the results to the existing empirical literature, the fixed effects and OLS estimation results for the growth equation are reported.

Authors:

Malcolm McPherson [malcolm_mcpherson@harvard.edu] is a fellow in development at the John F. Kennedy School of Government, Harvard University. His research interests include agricultural development, monetary theory and policy, structural adjustment, and factors impinging on growth in Africa, particularly HIV/AIDS. He has had numerous assignments in Africa, both as a consultant and resident advisor. He was senior advisor and chief of party for the Harvard Institute for International Development in Zambia from 1992 to 1996 overseeing projects on macroeconomic reform and the computerization of tax administration. During the 1980s, McPherson was a senior adviser to the ministry of finance and trade in The Gambia. The author of many publications, recent volumes completed under the Equity and Growth through Economic Research project include *Restarting and Sustaining Growth and Development in Africa* and *Promoting and Sustaining Trade and Exchange Rate Reform in Africa*. McPherson holds a Ph.D. in economics from Harvard University.

Tzvetana Rakovski is working as a research assistant on the Equity and Growth through Economic Research (EAGER) Project. She holds an M.A. degree in Economics from Northeastern University, Boston and a M.Sc. degree in Mathematics from Sofia University, Bulgaria. Her research interests are in the fields of International Development and Applied Econometrics. Her prior working experience includes a position as a researcher at the Agency for Economic Analysis and Forecasting (AEAF), Sofia, Bulgaria.

1. Introduction

Over recent years, a number of scholars have commented on the degree to which countries in sub-Saharan Africa (hereafter Africa) have been marginalized in world trade and exchange (Collier 1995; World Bank 1995; Yeats *et al.* 1996, 1997; Rodrik 1998). The data leave no doubt about the trend. Since 1975 world exports and imports measured in current dollars have increased by a factor of 6. By contrast, African exports and imports increased by a factor of 3. As a result, Africa's share in world trade[1] has declined from 3.1 percent of the total in 1975 to 1.5 percent in 1998. The lack of dynamism in trade has been accompanied by extremely modest changes in the composition of trade flows. A large body of theoretical and empirical research has linked Africa's poor economic performance to the slow growth of its exports and the import compression associated with the rapid growth of Africa's external debt.

Many of these studies emphasize the role of outward-oriented trade policies in raising economic performance. They highlight the lack of openness of African economies as a major restraint on long-term growth (Sachs and Warner 1996). This implies that attempts by African governments to restart and sustain economic growth and development will depend directly on their success in rationalizing policies related to trade and international exchange. Some analysts, however, have noted that trade ratios (the sum of imports and exports divided by GDP) in Africa have been systematically higher than in other regions of the world. This suggests that Africa's marginalization in world trade and exchange may be due to the slower growth of its aggregate GDP rather than lower propensities to trade (Rodrick 1998). If this is so, trade liberalization and export promotion will be only part (and perhaps not even the most important part) of the policy changes that are needed to revive and sustain growth and development across Africa.

There are now many studies linking trade and growth in Africa. Most studies, however, explore one dimension of this relationship using single equation techniques. The typical approach has been to regress the growth of income on a range of geographic, social, and economic variables, including an index of trade (either the growth of exports or exports plus imports). Even when instruments are used to correct for the endogeneity of the trade variable, some important connections within the growth-trade relationship itself remain unexplored.

This study explicitly attempts to take account of the direct, indirect, and inter-temporal effects between income growth and trade. We use a simultaneous equations model that includes real income growth; trade share; the growth rate of real investment; changes in the exchange rate; and the inflation rate as endogenous variables. The model accounts for the simultaneity among the key variables and allows for direct and indirect effects between trade and income growth. It also makes possible the investigation of other relevant variables relevant to the trade-growth relationship. The lagged values in the model provide a means of testing for inter-temporal effects and causality. The model is estimated with data from 33 African countries over a period of 29 years (1970 to 1998). The coefficients of the structural equations are derived using a dynamic panel general method of moments (GMM) estimator, which gives consistent estimates in the presence of endogenous regressors, lagged endogenous variables, and regressors correlated with country effects. For comparison purposes, we also derive three-stage least squares (3SLS) estimates. As a means of linking our results to the existing

empirical literature, we report the fixed effects and OLS estimation results for the growth equation.

The paper is arranged as follows. Section 2 discusses the nature of the trade-growth nexus drawing on illustrations from the recent literature. Section 3 presents the model and defines the relevant concepts and data used in the analysis. Section 4 reports the empirical findings and examines their implications. Section 5 has a summary and conclusion.

2. Background–Analyses of Trade and Growth in Africa

Comparative studies based on growth regressions with global cross-country data have identified several reasons for Africa's declining contribution to world income and trade. Commonly recognized factors include the lack of openness to international trade; the continued heavy reliance on primary product exports; weak institutions; poorly developed infrastructure; political instability; geographic isolation; and an unfavorable (tropical) climate (Collier 1995; World Bank 1995; Sachs and Warner 1996; Yeats *et al.* 1996, 1997; IMF 1999:Ch. 4). Sachs and Warner argue that a lack of openness prevented countries in Africa from taking advantage of improved efficiency, increased competition, and the transfer of technology that comes from greater openness to trade. Using a long-term growth model, they find a significant positive relationship between trade openness and income growth. Their estimates show that African countries could have potentially added 1.4 percent per annum to their per capita income growth over the period 1965 to 1995 if trade regimes had been more open.[2]

The advantages of greater openness have also been stressed in comparisons of Africa's economic performance with that of fast-growing countries in other regions, especially East and South-East Asia. In drawing lessons for Africa from Asia's experience, researchers have given special emphasis to the advantages of pursuing aggressive export promotion strategies (Winrock 1991; World Bank 1994; Lindauer and Roemer 1994). This is consistent with the more general trade literature which devotes considerable effort to identifying the mechanisms whereby outward-oriented trade policies foster export expansion and higher economic growth (Roemer 1994:Ch. 7; Gillis *et al*. 1996:Ch.19; Sharer 1999).

Some studies have stressed the adverse effect on factor productivity of inward-looking economic policies and trade protection. Edwards (1994, 1997) uses a standard production function to measure the effect of trade restrictions on total factor productivity and output in a sample of advanced and developing countries. Drawing on nine different measures of openness and a composite index constructed from all of them, he found a significant and robust positive effect of openness on long-term output growth.

Other analysts have tended to focus on developments within Africa. Regional studies on the impediments to growth have highlighted the (many) restrictions on trade and international exchange that distort markets and incentives (Nash 1994; Collier and Gunning 1999).

For example, Collier and Gunning investigated the macro and micro-level effects of restrictive trade policies. Although they do not present new empirical work, the authors discussed

aggregate and firm level evidence that trade restrictions reduced growth, primarily by lowering the rate of investment.

The study by Calamitsis, Basu, and Ghura (1999) is a further example of the single equation approach so widely used to analyze the link between trade and growth. Although their study is intended as a means of understanding the broader determinants of economic performance, their results also show that growth and trade are significantly and positively related. Using data from the period 1981 to 1997 for 32 African countries, they regress the growth of per capita real income on the initial level of income; the population growth rate; the ratios of private and government investment to GDP; an index of human capital; a dummy for IMF-supported adjustment programs; the rate of inflation; the standard deviation of the inflation rate; the ratio of the budget deficit to GDP; the percentage change in the real effective exchange rate; the growth of exports; the percentage change in the terms-of-trade; an index of "political rights and civil liberties"; and a dummy for war years (*ibid* pp. 5-6). This is a lot of water for one equation to carry, particularly when the authors provide only the barest description of the underlying structural relations. The results that directly interest us are those showing that the real effective exchange rate, the growth of exports, and the change in the terms of trade were all statistically significant and of the expected (negative, positive, and positive) signs (*ibid* Table 4, pp. 26).

A common criticism of empirical analyses of the trade-growth relationship is that they do not account for the endogeneity of trade.[3] In any economy, both trade and income will be influenced by many of the same exogenous factors. Because of this, the standard regression procedures cannot establish unambiguously the direction and the magnitude of the links between trade and income growth. Simultaneity among exports, imports, and income produces an upward bias in the estimated coefficients and confounds their direction of association. The implication is that the significant positive direct relationship between trade and income that is so regularly reported in the literature calls for more careful investigation. One way of dealing with the problem of endogeneity is to use instrumental variable estimators. This approach, however, shifts the problem to that of choosing an appropriate instrument for the trade variable.

Frankel and Romer (1999) confronted this issue in their recent study of the effects of trade on economic growth. They constructed an instrument for the trade share using fitted values from a bilateral trade equation based on the gravity model of trade. Each equation contained geographic distance from major ports and size of the economy as explanatory variables. They use global cross-country data to regress income per capita on the constructed trade share. Their instrumental variable procedure yields a significant positive relationship between trade and income.[4] They extend their analysis by exploring the mechanisms through which trade raises income. They regress each term of a standard production function on the same right hand side variables: the constructed trade share, population, and country size.

The results show that trade directly increases income positively by affecting each component of the production function: physical capital, schooling and, most strongly, productivity. Yet, as the authors note, their results are embedded in their "geography as a determinant of trade" framework. In order to focus specifically on the effect of trade on income, they had to

deliberately abstract from any other factors that may be endogenous to the trade-growth relationship. From the point of view of our study, an interesting sidelight of Frankel and Romer's analysis is that, after taking into account the effects of geographical distance, they find no evidence that the trade shares of African countries have been systematically lower than those of countries in other regions. Declining trade, therefore, is not a convincing explanation of Africa's marginalization in the world economy.

Rodrik (1998) also examined the direct link between trade (trade policy) and income growth. He noted that once account is taken of their income levels and economic size, African countries trade on average as much as other countries. Rodrik's objective was to determine how much of the variation in Africa's trade performance, measured as the trade share in GDP, was due to the effect of terms of trade, geographical factors, and domestic policies. His results confirm the importance of geography, fiscal policy, and export taxation. Using a regression of the Sachs/Warner type, Rodrik also tested the impact of trade on the long-term growth of output in Africa. He found that economic growth could be explained by a few fundamental factors: human resources, demography, and fiscal policy, but not trade policy. Over shorter periods, movements in the terms-of-trade also appear to have had a significant impact on growth. Based on this evidence he concluded that, within Africa, trade policies have had the expected strong effect on the volume and growth of trade, but have played a significantly smaller role in stimulating income growth than earlier results suggest.

A study by Hoeffler (1999) also fails to find convincing evidence that trade influences the long-term growth rate in Africa. She derives this result from an augmented Solow growth model applied to panel data of African countries over the period 1970 to 1995. Hoeffler uses a GMM estimator in order to take into account hidden country effects, dynamic effects, and the endogeneity of the regressors. She shows that the investment rate, education levels, population growth, and initial output almost fully account for the observed growth of output.[5] This result implies that the main impact of trade on long-term income growth can only occur indirectly through the effect on the accumulation of human and physical capital.

Onafowora and Owoye (1998) explore the relationship between trade and growth using a vector-error correction model that includes output, exports, investment and an indicator for trade policy for twelve African countries. They attempt to determine whether export growth stimulated investment, thereby raising the rate of income growth. They show that the significance of each variable and the explanatory power of the model vary across the 12 country-cases. The authors conclude that the export-led growth framework, based on an explicit commitment to outward-looking policies and export expansion, has had some success in African countries.

The above studies (and others that could be cited) show that most empirical analyses of the relationship between trade and growth do not make allowance for possible indirect channels through which trade may feed back upon income growth. Doing this, however, requires that the relevant variables would need to be endogenized. Income growth would also need to be made a determinant of trade.

Some researchers have been moving in this direction. Ndulu and Ndung'u (1998), for

example, specify a simultaneous equations model that examines the effects of trade policies on export and import shares and how these variables are linked to income growth. Using panel data for selected African countries, they start with a random effects estimation of single equations for export share, import share, and income growth. Their explanatory variables are export and import prices; trade taxes; a measure for terms-of-trade shocks; indicators for the quality of institutions and civil unrest; changes in external debt; foreign direct investment; inflation; the ratio of investment to GDP; the real exchange rate; and lags of the trade shares. From each equation they drop the variables with insignificant coefficients in the random effects estimation. Using Full Information Maximum Likelihood (FIML), they estimate these three equations as a system. However, the authors also drop the contemporaneous values of the export and import shares from the income growth equation. Because of this, their analysis does not allow for feedback and inter-temporal effects between income growth and the trade variables.

Their results show that trade policies affect exports and imports, and thus output, indirectly through the real exchange rate. Ndulu and Ndung'u also find that the influence of trade reforms is transmitted through the growth of investment, and that the growth of output and its lag significantly affect the export and import shares.

These empirical findings do not diminish the importance of trade reforms in promoting sustained growth and development in Africa. Rather, they suggest that the relationship between trade and economic growth is significantly more complicated (and subtle) than revealed in the standard single equation analyses. For policy purposes, greater effort is needed to identify and understand the indirect associations between trade and growth, the inter-temporal effects, and the economic mechanisms through which these effects are transmitted. The model discussed in the next section moves in that direction.

3. Model and Data

3.1. Specification of the Model

With only two exceptions (Botswana and Mauritius), trade policy across Africa used to be based on the theory and practice of import-substituting industrialization. Governments imposed controls and restrictions on trade and exchange rates in order to expand local productive capacity and raise local incomes. When this approach began to experience difficulties, particularly from the late 1970s onwards,[6] African governments typically responded by further restricting international trade and exchange. Since none of the restrictions addressed the fundamental economic problems of distorted prices and markets and generalized inefficiency, the cascading of the controls simply compounded the difficulties. By the mid-1980s, an increasing number of African countries had started to reform their trade arrangements and liberalize their exchange rate systems. The reforms were designed to remove tariffs and non-tariff barriers; eliminate foreign exchange rationing; raise the level of efficiency in export sectors; rationalize the use of imported goods and services; and restore external and internal balance. These initiatives have been fundamental to all structural adjustment programs sponsored by the multilateral institutions. However, African governments have implemented them reluctantly and never in full. Furthermore, there have

been many reversals, particularly when governments and the IMF find that trade reform (in the form of reduced tariff rates) threaten short-term revenue targets.

This is the overall setting that generated the data used in our analysis. For most countries, economic disruption and persistent imbalances have been the norm rather than the exception. Accordingly, we should not be surprised when some of the estimated coefficients in the model do not accord with our *a priori* expectations derived from theoretical and institutional considerations. An example will illustrate. Under *ceteris paribus* conditions, devaluation of the exchange rate should reduce the growth of imports and raise the growth of exports. For highly distorted African economies that are undergoing a slow transition, exchange rate devaluation is almost invariably accompanied by an expansion of foreign assistance. Thus, the exchange rate can rise (i.e., devalue) at the same time that imports expand (often dramatically) with finance provided not through the expansion of exports but through foreign aid.

Net foreign aid to countries in sub-Saharan Africa (except Nigeria and South Africa) averaged more than 7 percent of GDP over the last three decades.[7] Because net aid flows have been so large, the governments have been able to delay the reforms needed to remove the distortions that undermine growth and development. The effects of these delays show up in the modeling exercise in two ways. Coefficients are less statistically significant than expected and, in some cases, the signs are the opposite of what theory suggests.

The endogenous variables in our model are the growth rate of real GDP, the trade ratio, the growth of real investment, the change in the nominal exchange rate, and the rate of inflation. Exogenous variables are money growth, the budget deficit, foreign inflation, and change in foreign aid.

This study is not an investigation of the effects on income growth of restrictions on trade and exchange. Our presumption is that the effects of the distortions to which each economy has been subject are fully reflected in the key macroeconomic variables used in the analysis.[8] Because our subject is the macro link between trade and income growth, we have used a broad index of trade. We do this for three reasons. First, a broad measure of trade allows us to abstract from the micro level distortions stemming from specific barriers to trade. Second, the trade ratio we use is common to other empirical studies. Third, the natural log of the trade share allows us to account for long-term regularities between exports and imports and output. It provides a proxy for the error-correction term derived from the regression of income (*not* changes in income) on exports and imports.

The specification of the equations presented below has emerged after some experimentation with different regressors and lag structures. Some exogenous and predetermined variables that we expected to have an impact were not significant and were dropped. We have noted these below whenever their exclusion is obvious or their non-performance provided relevant information about the structure of the model.

The equation for the growth of real income includes the fundamental determinant of long-term economic growth, namely, capital accumulation. Because capital series are not available for large numbers of African countries, we use the growth of real investment as a proxy for

capital accumulation. Theory suggests that the increase in investment should have a positive effect on the GDP growth rate. In the initial version of the growth equation we also included population growth as a proxy for labor force growth. It was statistically insignificant and was dropped. We include the trade share on the right hand side in order test the hypothesis that the expansion of trade *directly* contributes to the growth of income.

Since most African countries have experienced massive internal and external imbalances, trade and exchange rate reforms have been major elements in both local and externally sponsored adjustment programs. Discussions of the impact of these reforms highlight important aspects of the link between trade and growth (Frimpong-Ansah, Kanbur and Svedberg 1991; Dornbusch 1992; Nash 1993; Metzel and Phillips 1996; Andriamananjara and Nash, 1997). They point to the devaluation of the exchange rate as a crucial policy decision in the process of promoting outward-oriented economic reforms in Africa. This policy is implemented by changing the nominal exchange rate. However, it is the devaluation of the real exchange rate, which, if successful and sustained, transmits the effects of the reform to all sectors of the economy. Since the impact of the devaluation will take time to reverberate through the economy, we have included the lagged change in real exchange rate in the growth equation. The coefficient estimate is expected to be positive.

We also include foreign aid, measured as the change in Official Development Assistance, as a right hand variable. There is no consensus on the relationship between aid and economic growth. Recent studies show that the effect of aid, while positive, operates indirectly. These analyses, however, also suggest that the effect of aid will only be significant (and positive) in countries that are actively committed to economic reform (Burnside and Dollar 1997; World Bank 1998; McPherson and Gray 2000). Other studies, however, report a direct and robust positive effect of foreign assistance on income growth.[9] Given the size of net aid flows to African countries, this variable could not be excluded from the growth equation. In view of this ambivalence, and the history of aid to Africa (massive flows with little tangible growth response), the sign of the coefficient could go either way.

Finally, the lagged level of real income per capita is also included as a standard way of testing long-run equilibrium convergence. A statistically significant negative coefficient would support the convergence hypothesis in this sample of countries.[10]

The above considerations lead to the following growth equation:

$$\mathbf{dlny} = \alpha_0 + \alpha_1 \mathbf{dlnINV} + \alpha_2 \mathbf{Trade} + \alpha_3 \mathbf{dlne}_{t-1} + \alpha_4 \mathbf{dlnAid} + \alpha_5 \mathbf{lnypc}_{t-1} + \varepsilon_1,$$

where:

dlnINV is the change in real investment;
Trade is the log of the share of imports plus exports in GDP;
$\mathbf{dlne}_{t-1}$ is the lag of the change in real exchange rate;
dlnAid is the change in foreign aid; and
$\mathbf{lnypc}_{t-1}$ is the lag of real per capita income.

We expect the trade share to be significantly related to the changes in the real exchange rate and the overall economic performance measured by the growth of income.[11] The lagged value

of GDP growth is intended to capture inter-temporal effects. The lag of the change in real exchange rate was also tested but was insignificant and was dropped. The final version of the trade equation is:

$$\mathbf{Trade} = \beta_0 + \beta_1\,\mathbf{dlny} + \beta_2\,\mathbf{dlny}_{t-1} + \beta_3\,\mathbf{dlne} + \beta_4\,\mathbf{Trade}_{t-1} + \varepsilon_2,$$

where:

dlne is the change in real exchange rate;
$\mathbf{dlny}_{t-1}$ and $\mathbf{Trade}_{t-1}$ are the lagged value of output growth and the trade share, respectively.

African countries import a large portion of their investment goods. Many researchers have argued that the strongest effect of an increased volume of trade (particularly imports) would result from increases in the capital stock. In order to investigate this aspect of the trade-growth relationship we include an equation for the change in real investment. Explanatory variables are the change in real income, based on the acceleration principle, and the trade share. We have also included the real exchange rate to ensure that the model is fully simultaneous.

Because a large amount of investment is financed by foreign aid, we had included the change in foreign aid in the equation. Given the budget pressures experienced across Africa, we expected that foreign aid would ease local financial constraints, thus giving a boost to investment. However, after some testing, the foreign aid variable was not significant at the standard levels, so it was dropped. The investment equation is:

$$\mathbf{dlnINV} = \gamma_0 + \gamma_1\,\mathbf{dlny} + \gamma_2\,\mathbf{Trade} + \gamma_3\,\mathbf{dlne} + \gamma_4\,\mathbf{dlnINV}_{t-1} + \varepsilon_3,$$

where $\mathbf{dlnINV}_{t-1}$ is the lag of the change in real investment, and other variables are as described above. We expected all of the estimated coefficients to have positive signs.

Changes in nominal exchange rates are relevant to both trade and income growth. Movements in the exchange rate have been an important indicator of the general priority given by African governments to economic reform. Moreover, as one of the key relative prices in the economy, the exchange rate typically reflects the pressures that emerge when African governments formally liberalize (e.g. through tariff reductions) but informally restrict trade and exchange (e.g., by providing favored access to credit or foreign exchange to selected entities). The exchange rate equation is based on the purchasing power parity hypothesis and follows a specification used in many studies of exchange rate movements. It includes domestic inflation, foreign inflation, real income growth, and the lagged change in the exchange rate.

The exchange rate equation is:

$$\mathbf{dlnE} = \eta_0 + \eta_1\,\mathbf{dlnP} + \eta_2\,\mathbf{dlnPf} + \eta_3\,\mathbf{dlny} + \eta_4\,\mathbf{BD} + \eta_5\,\mathbf{dlnE}_{t-1} + \varepsilon_4,$$

where:

dlnE is the change in nominal exchange rate;
dlnP is domestic inflation;
dlnPf is foreign inflation;

BD is the ratio of budget deficit to GDP; and
$\mathbf{dlnE_{t-1}}$ is the lag of **dlnE**.

Domestic inflation serves as a proxy for an increase in the price of non-tradables. The estimated coefficient should be positive. As a measure of the change in the price of tradables, foreign inflation is expected to have a negative sign.

As a means of endogenizing changes in the real exchange rate, the model includes an inflation equation. This equation is derived from the modern quantity theory of money and features the growth of real output and the money supply on the right hand side. In theory, increases in the money supply will raise the rate of inflation. We would expect an expansion in real income (as a proxy for output) to have the opposite effect. The budget deficit is included to account for devaluation-inflation spirals that may emerge when African governments cannot control their budget deficits following a devaluation of the exchange rate. Foreign inflation is included to account for the widespread complaint by African governments that "imported inflation" has added to their economic difficulties. Finally, we include lagged inflation as a simple form of measuring inflation expectations or price inertia. The price equation is:

$$\mathbf{dlnP} = \varphi_0 + \varphi_1 \mathbf{dlny} + \varphi_2 \mathbf{dlnE} + \varphi_3 \mathbf{dlnM} + \varphi_4 \mathbf{dlnPf} + \varphi_5 \mathbf{dlnP_{t-1}} + \varepsilon_5,$$

where:
dlnM is the growth of nominal money; and
$\mathbf{dlnP_{t-1}}$ is lagged inflation.

Collecting all five equations, the model is:

$$\mathbf{dlny_{it}} = \alpha_0 + \alpha_1 \mathbf{dlnINV_{it}} + \alpha_2 \mathbf{Trade_{it}} + \alpha_3 \mathbf{dlne_{it-1}} + \alpha_4 \mathbf{dlnAid_{it}} + \alpha_5 \mathbf{lnypc_{it-1}} + \varepsilon_{1,it},$$

$$\mathbf{Trade_{it}} = \beta_0 + \beta_1 \mathbf{dlny_{it}} + \beta_2 \mathbf{dlny_{it-1}} + \beta_3 \mathbf{dlne_{it}} + \beta_4 \mathbf{Trade_{it-1}} + \varepsilon_{2,it},$$

$$\mathbf{dlnINV_{it}} = \gamma_0 + \gamma_1 \mathbf{dlny_{it}} + \gamma_2 \mathbf{Trade_{it}} + \gamma_3 \mathbf{dlne_{it}} + \gamma_4 \mathbf{dlnINV_{it-1}} + \varepsilon_{3,it},$$

$$\mathbf{dlnE_{it}} = \eta_0 + \eta_1 \mathbf{dlnP_{it}} + \eta_2 \mathbf{dlnPf_{it}} + \eta_3 \mathbf{dlny_{it}} + \eta_4 \mathbf{BD_{it}} + \eta_5 \mathbf{dlnE_{it-1}} + \varepsilon_{4,it},$$

$$\mathbf{dlnP_{it}} = \varphi_0 + \varphi_1 \mathbf{dlny_{it}} + \varphi_2 \mathbf{dlnE_{it}} + \varphi_3 \mathbf{dlnM_{it}} + \varphi_4 \mathbf{dlnPf_{it}} + \varphi_5 \mathbf{dlnP_{it-1}} + \varepsilon_{5,it}.$$

3.2. Data Description and Sources

Our data set consists of annual observations for the period 1970 to 1998. We started with series for 39 countries but due to various gaps, the data set used in the regression analysis covers 33 countries.[12] The main source of data has been the World Bank Africa 2000 CD-ROM database.

The real variables are measured in constant domestic currency units. The money variable is M2, i.e. the sum of demand deposits and time and savings deposits. The budget deficit is defined as the overall budget surplus/deficit excluding grants as a percent of GDP. The exchange rate is defined in units of domestic currency per US Dollar. Thus, an increase in

exchange rate represents a devaluation of the domestic currency. The real exchange rate is calculated as the nominal exchange rate multiplied by the ratio of an index of the price of tradables to an index of the price of non-tradables. For consistency with other empirical work, we use the US producer price index (PPI, 1995=100) as the price of tradables. This series also serves as the measure of foreign inflation. The price of non-tradables is measured by the domestic consumer price index (CPI, 1995=100). The data for the US producer price index were obtained from the International Financial Statistics included on the IMF's March 2000 CD-ROM database. Foreign aid is the Official Development Assistance series from the World Bank database. It is measured in millions of US Dollars.

Most variables in the model are in first differences in natural logs. Exceptions are the trade share and budget deficit, both measured relative to GDP, and the lagged level of real GDP per capita that is included in the growth equation. As noted above, the trade share is in natural log form. Summary statistics covering all 39 countries are presented in Table 1.

Table 1. Summary Statistics

Variable	Number of Obs.	Mean	Std. Dev.	Min	Max
dlny	973	0.030	0.068	-0.683	0.566
DlnINV	933	0.028	0.276	-1.337	1.718
Trade share	1034	0.670	0.355	0.063	2.380
Export share	1034	0.286	0.177	0.025	1.015
Import share	1034	0.384	0.225	0.030	1.604
dlnE	1087	0.127	0.397	-0.260	6.163
dlne	733	0.003	0.166	-0.713	1.095
dlnM	961	0.195	0.335	-1.698	4.258
dlnP	735	0.165	0.273	-0.103	3.627
dlnPf	1092	0.043	0.048	-0.029	0.172
Bd	628	-8.083	8.509	-67.705	16.024
dlnAid	1070	0.128	0.842	-1.986	24.039

The average annual GDP growth rate over the sample period is 3.0 percent. Since the population growth rate averaged 2.7 percent per annum, average real income per capita expanded by approximately 0.3 percent per annum. The average annual growth of real investment was 2.8 percent. After allowing for depreciation, real capital per capita declined over the period examined. It is therefore no surprise that GDP growth has been so low.

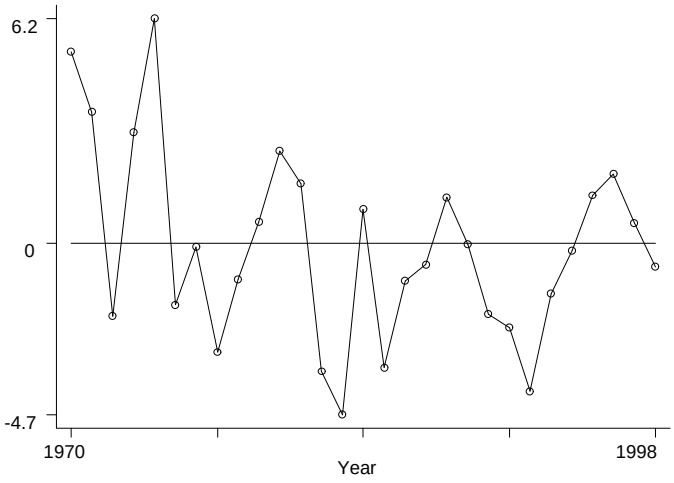
With respect to the exchange rate, the average annual rate of devaluation for all 39 countries was 12.7 percent. Domestic inflation averaged 16.5 percent per annum while foreign inflation was 4.3 percent per annum. These relative movements explain why the real exchange rate moved so little, barely 0.3 percent per annum. Though the situation varied across countries, for the whole sample there was little evidence that exchange rate reform had been effective or significant.

The trade shares averaged 67 percent for the sample as a whole, although with a large variance. The average growth of the money supply was 19.5 percent, reflecting among other things the average annual budget deficit of 8.1 percent of GDP. Finally, as noted above

foreign aid flows were large, growing at almost 13 percent per annum in dollar terms. These flows also vary considerably across countries and over time.

Some of the more important trends are shown graphically. Figure 1 illustrates the developments in income and trade in the 39 countries over the sample period. It traces per capita income, the growth rate of per capita income, and trade share over time. The series for per capita income declined steeply from the beginning of the 1980s. Some recovery is evident in the 1990s but income remains at levels below those reached in the 1970s. Per capita real income growth rate has been mostly negative since the late 1970s. The aggregate trade volume fell sharply between 1980 and 1983. The recovery since 1983, and especially in the early 1990s, owes much to trade liberalization programs undertaken across Africa with the support of the donor community.

Figure 1. Sub-Saharan Africa: Real GDP per capita growth, 1970-98



A wide range of individual country performances underlies these aggregate regional data. Table 2 has the average growth rates of real per capita income of the 15 highest growing countries in the periods 1970-79, 1980-89 and 1990-1998. At the bottom of the table are given the average growth rates for sub-Saharan Africa and the world. The per capita growth rates among the African countries have diverged sharply. Some countries (Botswana, Lesotho, and Mauritius) have grown rapidly by world standards over the last three decades. Other countries have experienced only short periods of high growth, most often due to external favorable conditions (Gabon and Nigeria in the 1970s). Cameroon and Kenya's growth performance has worsened over time.

Table 2. Average Growth of Income Per Capita by Decade (in percent)[*]

Country	1970-79	Country	1980-89	Country	1990-98
Botswana	11.73	Botswana	6.83	Eq. Guinea	15.20
Gabon	6.59	Congo, Rep.	3.82	Mauritius	4.14
Lesotho	6.03	Swaziland	3.54	Uganda	3.50
Mauritius	5.48	Mauritius	3.32	Lesotho	3.34
Cameroon	4.48	Zimbabwe	1.79	Mozambique	3.22
Nigeria	3.98	Burundi	1.44	Botswana	2.67
Côte d'Ivoire	3.42	Lesotho	1.26	Guinea	1.91
Kenya	3.36	Chad	1.22	Malawi	1.60
Mali	3.01	Burkina Faso	1.14	Benin	1.47
Malawi	3.01	Cameroon	1.11	Ghana	1.42
Burundi	2.92	Guinea-Bissau	0.70	Chad	1.39
Swaziland	2.60	Kenya	0.56	Burkina Faso	1.16
Congo, Rep.	2.60	The Gambia	0.42	Ethiopia	1.11
Rwanda	1.91	Rwanda	0.10	Gabon	0.71
The Gambia	1.63	Benin	-0.02	Namibia	0.64
SSA	1.1	SSA	-0.7	SSA	-0.8
World	2.1	World	1.2	World	0.9

Note: [*] - The 15 highest growing SSA countries for each decade are listed in a descending order.

Table 3 provides some idea of the breadth of changes in trade and income in Africa over the same three periods. For each decade the corresponding table has data for most African countries on average per capita income and trade, exports, imports and net exports as a percent of GDP. Excluded from the tables are a few countries with missing observations for most of the years in the period. The countries are ranked in a descending order of average per capita income (the first column of each table). Again, the bottom of the table has data for sub-Saharan Africa as a whole and the world.

Excluding Lesotho and Swaziland, which have special links to South Africa, trade ratios range from 0.25 (Ghana in the 1980s) to 1.27 (Mauritius in 1990-98). Ten countries had a trade share of more than 0.75 in the 1970s. Nine had trade shares greater than 0.75 in the 1980s. For the years 1990-98, eleven countries had trade shares greater than 0.75. Net exports are negative for most countries. All countries with positive net exports in the 1980s and 1990s are natural resource exporters. The tables show that for each decade the average trade share of most countries in the sample has exceeded the average trade share of the world.

Table 3. Average Income Per Capita, Trade, Exports, Imports, and Net Exports in Sub-Saharan Africa, 1970-79

Country	GDP p.c. (1995 USD)	Trade	Exports	Imports	Net Exports
Gabon	5345	107	57	49	8
South Africa	4324	53	27	26	2
Mauritius	1605	98	47	51	-4
Botswana	1108	86	38	49	-11
Côte d'Ivoire	1065	72	38	34	3
Swaziland	950	141	72	69	3
Zimbabwe	653	43	22	21	1
Congo, Rep.	640	96	39	57	-18
Zambia	636	85	44	41	3
Senegal	605	71	32	39	-7
Cameroon	595	49	23	26	-3
Mauritania	570	86	36	50	-14
Central African Rep.	458	62	26	37	-11
Ghana	437	33	16	16	0
Togo	403	97	48	48	0
Congo, Dem. Rep.	381	29	13	16	-3
Madagascar	367	37	16	21	-6
Benin	350	58	23	35	-13
The Gambia	343	83	37	47	-10
Niger	335	44	18	27	-9
Sierra Leone	311	51	23	29	-6
Nigeria	304	36	18	18	0
Kenya	298	63	30	33	-3
Mali	276	36	12	25	-13
Rwanda	262	31	13	18	-6
Lesotho	249	109	15	94	-80
Chad	245	42	16	26	-10
Guinea-Bissau	218	39	5	34	-28
Burkina Faso	196	34	8	26	-18
Burundi	168	28	12	17	-5
Malawi	153	65	26	39	-13
SSA	648	54	26	34	-8
World	4006	31	15	16	-1

Note: Countries are listed in a descending order of their average income per capita for the decade. Trade (Exports plus Imports), Exports, Imports, and Net Exports are given in percent of GDP.

4. Estimation Results and Implications

Taking into account exclusions, series that are dropped during estimation, first differences, and lags, the results are based on an unbalanced panel of 458 observations. Coefficients of the simultaneous system are derived using three stage least squares (3SLS) and the dynamic panel GMM estimators.[13] To obtain the income growth equation on its own, we use the within groups and OLS estimators. The results are presented in the following sections.

4.1. Three Stage Least Squares Estimation Results

3SLS is a full-information instrumental variables method. It yields consistent and efficient estimates when the endogenous variables are jointly dependent and the disturbances in the structural equations are contemporaneously correlated. The regression assumes pooled time series cross-section data. Table 4 has the 3SLS results.

The results of each equation are given down the column. The first column refers to income growth; the second, trade; the third, investment; while the fourth and fifth, respectively, refer to the nominal exchange rate and inflation. The t-statistics are reported in parentheses beside each coefficient.

In the growth equation, the estimated coefficients on the growth of real investment and the lagged change in the real exchange rate have the expected positive signs and are statistically significant. The coefficient on the trade variable is negative but not statistically significant. That is, within the framework provided by the model, trade does not directly determine growth. Foreign aid has a positive coefficient but is not statistically significant. The coefficient of lagged real per capita income is negative but statistically insignificant. The (rather distressing) implication is that for the 33 countries and period considered there is no robust statistical evidence for the convergence hypothesis. Since average real incomes have grown relatively rapidly outside Africa, this evidence suggests that Africa has not only been marginalized but also tangibly left behind.

In the trade equation, both contemporaneous and lagged income growth have a positive effect on trade. This result supports the view that income growth directly boosts trade. The contemporaneous value of the change in the exchange rate is positively related to trade. African countries, it appears, have been directly and immediately responsive to an exchange rate liberalization. Finally, the lagged value of the trade share dominates the regression.

The estimated coefficients of the domestic and foreign inflation in the exchange rate equation have the theoretically correct (positive, negative) signs. Both coefficients are statistically significant. An increase in domestic inflation leads to overvaluation. The growth of income has a significant positive impact on the change in the exchange rate. When seen together with the strong positive effect of the change in the exchange rate in the growth equation, this result shows that successful exchange rate policy reform (in the form of a sustained real devaluation) would improve Africa’s growth performance.

The budget deficit ratio has a significant negative, though small, coefficient confirming the widely observed outcome that higher government deficits systematically overvalue the exchange rate. Finally, the lagged change in the exchange rate has a negative coefficient, suggesting that the adjustment path for the exchange rate oscillates.

Table 4. SLS Estimates

Variable		Equation				
		dlny	Trade	dlnINV	dlnE	dlnP
Dlny	Real GDP growth	-	1.002 (2.248)	3.603 (4.866)	9.388 (8.099)	-1.449 (-4.118)
DlnINV	Real investment growth	0.063 (2.413)	-	-	-	-
Trade	Trade share	-0.001 (-0.330)	-	-0.022 (-1.004)	-	-
DlnE	Change in exchange rate	-	-	-	-	0.105 (4.078)
Dlne	Change in real ex. rate	-	0.487 (15.137)	0.182 (3.644)	-	-
DlnM	Growth of money	-	-	-	-	0.212 (7.221)
DlnP	Inflation rate (domestic)	-	-	-	1.029 (8.077)	-
DlnPf	Inflation rate (foreign)	-	-	-	-1.440 (-4.054)	0.183 (1.134)
BD	Budget deficit to GDP ratio	-	-	-	-0.010 (-3.981)	-
DlnAid	Change in foreign aid	0.001 (0.427)	-	-	-	-
$dlny_{-1}$	Lag of real GDP growth	-	0.243 (2.189)	-	-	-
$DlnINV_{-1}$	Lag of real inv. growth	-	-	-0.193 (-4.796)	-	-
$Lnypc_{-1}$	Lag of real p.c. income	-0.004 (-1.178)	-	-	-	-
$dlne_{-1}$	Lag of change in real ex. rate	0.021 (1.996)	-	-	-	-
$dlnE_{-1}$	Lag of change in ex. rate	-	-	-	-0.171 (-2.224)	-
$Trade_{-1}$	Lag of trade share	-	0.967 (82.515)	-	-	-
$dlnP_{-1}$	Lag of inflation	-	-	-	-	0.546 (17.622)
Constant		0.065 (2.101)	-0.050 (-2.860)	-0.094 (-2.983)	-0.315 (-6.951)	0.053 (4.760)
N	Number of observations	458	458	458	458	458
"R-sq."		0.21	0.94	0.21	-2.55	0.61

Note: t-statistics are given in parentheses

The estimated coefficients of all explanatory variables in the equation for inflation have the expected signs and, with the exception of the parameter for foreign inflation, they are all statistically significant. As a proxy for the increase in supply, real income growth reduces the rate of inflation. As expected, the growth of the money supply has a strong positive effect on inflation. Exchange rate depreciation is also positively associated with inflation, suggesting that the creation of money and credit has supported a devaluation-inflation spiral, largely due to the inability of governments to control their budget deficits following devaluation. The highly significant (and positive) coefficient on lagged inflation indicates that, in this sample of countries, inflation had developed a high degree of inertia.

The 3SLS estimates provide a useful benchmark against which the dynamic panel GMM and the within groups and OLS results for the growth equation can be compared.

4.2. GMM Results

Several features of the panel data and the model specification make the dynamic panel GMM estimator suggested by Arellano and Bond (1991) an appropriate choice. First, there are endogeneous regressors in the model, implying that the error terms will be correlated with the explanatory variables. Second, lagged dependent variables included on the right hand side of the equations introduce an additional inter-temporal correlation effect on the error term. Third, there is undoubtedly an additional bias due to correlation of some regressors with the country-specific effects. For example, the change in exchange rate is a policy variable that reflects the domestic attitude to outward orientation. Aid flows have also reflected local considerations. In most cases, the worst performing countries receive the largest amounts of support.

To derive unbiased and consistent estimates given these difficulties, we follow the approach taken by several analysts using the dynamic panel GMM estimator (Caselli *et al*. 1996; Hoeffler 1999; Gyimah-Brempong and Traynor 1999). Specifically, we use the extended version of the GMM estimator that estimates the model in first differences with levels of the variables as instruments. The results are derived through a two-step estimator. This approach is more efficient in the presence of heteroskedastic error terms as the instrument matrix is weighted by the residuals from the one-step estimation rather than with a set of predetermined elements.

For the estimation we use, one- and two-period lags of the explanatory variables in order to eliminate serial correlation and ensure that first and second lags of the exogenous variables and the second lag of the endogenous variables can be used as instruments. The absence of first- and second-order serial correlation in the first-differenced residuals is tested and the p-values of the statistics are shown in the table below. Wald statistics for joint significance of all regressors and selected regressors in each equation are also presented. One feature of the GMM estimator that should be noted is that the results can be sensitive to the choice of variables in the instrument matrix. [14]

Table 5. Dynamic Panel GMM

Variable		Equation				
		dlny	Trade	DlnINV	dlnE	dlnP
Dlny	Real GDP growth	-	-0.968 (-0.615)	1.510 (2.350)	1.012 (6.564)	-0.373 (-3.303)
DlnINV	Real investment growth	0.1434 (4.331)	-	-	-	-
Trade	Trade share	0.006 (1.115)	-	-0.463 (-1.568)	-	-
DlnE	Change in exchange rate	-	-	-	-	0.251 (4.799)
Dlne	Change in real ex. Rate	-	0.400 (2.106)	0.835 (3.097)	-	-
DlnM	Growth of money	-	-	-	-	0.220 (3.168)
DlnP	Inflation rate (domestic)	-	-	-	0.782 (8.059)	-
DlnPf	Inflation rate (foreign)	-	-	-	-1.277 (-6.049)	0.378 (3.575)
BD	Budget deficit to GDP ratio	-	-	-	-0.001 (-9.803)	-
DlnAid	Change in foreign aid	-0.002 (-1.253)	-	-	-	-
$dlny_{-1}$	Lag of real GDP growth	-	0.308 (1.944)	-	-	-
$DlnINV_{-1}$	Lag of real inv. Growth	-	-	-0.489 (-2.988)	-	-
$Lnypc_{-1}$	Lag of real p.c. income	-0.002 (-1.632)	-	-	-	-
$dlne_{-1}$	Lag of change in real ex. Rate	0.024 (1.817)	-	-	-	-
$dlnE_{-1}$	Lag of change in ex. Rate	-	-	-	0.054 (0.552)	-
$Trade_{-1}$	Lag of trade share	-	0.856 (5.629)	-	-	-
$dlnP_{-1}$	Lag of inflation	-	-	-	-	0.734 (7.264)
	Wald test of joint significance	1168.12 (5)	43479.61 (5)	112.52 (4)	7112.98 (5)	5503.35 (5)
	Wald test (selected regressors)	73.66 (dlnINV, Trade)	5.99 ($dlny_{-1}$, dlne)	17.10 (dlny, Trade)	116.57 (dlny, dlnp)	81.02 (dlny, dlne)
	First-order serial correlation	p=0.50	p=0.97	p=0.94	p=0.36	p=0.19
	Second-order serial correlation	p=0.69	p=0.39	p=0.17	p=0.12	p=0.11

Notes: t-statistics are given in parentheses
P denotes p-values

Overall, the results from the GMM estimation are similar to those obtained using 3SLS. This is not surprising since the principal advantage of the GMM estimator relative to 3SLS is asymptotic efficiency. The specification of the model and its explanatory power can be judged from the summary statistics. The test statistics for first- and second order serial correlation show that the null hypothesis of non-existence can be accepted in all cases based on the corresponding p-values. This ensures the consistency of the GMM estimator when first and second lags of all (exogenous and endogenous) variables are used as instruments. The Wald test statistics show that the regressors in each equation are jointly significant (the degrees of freedom are given in parentheses) and the coefficients of selected key explanatory variables in each equation (also in parentheses) are jointly significantly different from zero.

The GMM results confirm the insignificant direct effect of trade on income growth. They also reconfirm the positive and significant effect of the lagged (in this case) income growth on trade. The statistically insignificant coefficient on the contemporaneous value of growth in the trade equation reinforces the view that in this sample of countries it has been income growth that has directly boosted trade, not the other way round.

These results, like those derived using 3SLS, support the hypothesis that trade indirectly affects economic growth through changes in the real exchange rate. The role of investment growth as a channel between trade and income growth effects remains ambiguous and warrants further investigation.

4.3. Within Groups and OLS Estimates of the Growth Equation

In a panel data model with predetermined variables and individual country effects, the within group estimator gives consistent estimates for a sufficiently large number of time observations. However, if the model incorporates endogenous variables as regressors, these estimates will be biased. In order to compare our results with single-equation analyses of trade and growth, we estimate the growth equation in the system as a single equation using the within groups estimator for panel data.

A well-known disadvantage of all full information estimation methods is that any specification error within the system affects all coefficient estimates in all equations. This, of course, is simply the counterpart of the fact that a major advantage of full-information methods is that they take into account all information available both within and across equations of a system. Estimating an equation of a model as a single equation helps us understand the relative importance of these systemic influences. Our basic argument in this paper is that some of the links across equations have highly relevant economic effects.

Table 6 below has results from the within groups panel estimation of the growth equation and, as a reference, the results from applying ordinary least squares (OLS) with robust standard errors.

Some important differences emerge when these results are compared with those in Tables 4 and 5. The OLS results show that the parameter estimate of the trade variable is positive and significant at 1 percent. This reproduces the conventional result of a direct positive relationship between trade and growth.

Table 6. Within Groups and OLS Estimates of the Growth Equation

Variable		OLS		Within Groups	
dlnINV	Real investment growth	0.134	(5.929)	0.127	(14.030)
Trade	Trade share	0.013	(3.328)	0.012	(1.203)
dlnAid	Change in foreign aid	-0.002	(-1.209)	-0.002	(-1.103)
$lnypc_{t-1}$	Lag of real per capita income	-0.001	(-1.086)	-0.057	(-3.636)
$dlne_{t-1}$	Lag of change in real ex. Rate	0.014	(1.150)	0.012	(0.874)
N	Number of observations	647		647	
R-sq.		0.28		0.28	
RMSE		0.054		-	
F		13.01		-	

Notes: t-statistics are given in parentheses

A further important difference is that the coefficient on the lag of real per capita income is negative (as required by the convergence hypothesis) and statistically significant in the within groups estimation. Unlike the results from the simultaneous equations model, the single growth equation regression seems to show (as others report in the literature) that African incomes are converging (albeit slowly).

5. Summary and Concluding Observations

The results presented in this paper call into question what has almost become a stylized fact of development studies–namely, that the growth of income is directly related to the growth of trade with trade driving growth. Empirical studies that produce this result have been typically based on single equation growth regressions. These analyses invariably provide robust statistical associations that show trade (measured in a variety of ways) is a "source" of income growth. The problem, however, is that the basic methodology automatically precludes any consideration of the mutual dependence that exists between trade and income growth.

The simultaneous system we present in this paper moves beyond such one-dimensional estimates. The dynamic panel estimator we use takes into account the simultaneity between the key variables, inter-temporal effects, and hidden fixed effects. Though our framework is simple, the results illustrate that the underlying relationship between trade and income growth is significantly more complex than the all too common view that trade is an engine (or source) of growth.

Based on data from 33 African countries over the period 1970 to 1998, our results show that the effect of growth on trade is direct, with a possible lag, and the impact of trade on growth is indirect. In our model, the latter is channeled through changes in the exchange rate, inflation, and the real exchange rate. Single equation growth regressions miss these economically relevant details.

Our data, model specification, and estimation procedures could be readily refined. An obvious change would be to decompose the trade share to examine the separate effects of exports and imports.[15]

Our results also raise some interesting questions. If, in fact, growth drives trade, what policies will be needed for reversing Africa's marginalization in the world economy? Does the widely recommended approach of promoting exports need to be recast? Since an increasing number of African policy makers have been seeking to learn from Asia's growth experience, is there a need to re-examine the determinants of the "Asian miracle." In particular, was rapid growth in Asia export-led as so many scholars contend? Or, in the light of the above results, might the rapid Asian growth have been the result of changes (such as an appropriate real exchange rate, and legal and institutional changes) that, while important in promoting trade, provided the incentives that boosted domestic output? That the non-city states in Asia experienced substantial growth in their agricultural sectors *before* their manufactured exports grew rapidly, suggests that important internal realignments occurred to raise domestic output. Finally, as a

more general matter, if growth drives trade, can growth economists continue to treat trade as a "source" of growth?

In summary, the results we present support the view that Africa's marginalization in the world economy has been rooted in the lack of growth across the continent rather than the lack of trade. The policy implications are immediate. African countries need to focus in a sustained way on policies that promote growth. Since most of these policies will involve the removal of domestic imbalances and distortions, they will also give a boost to trade. Based on the evidence we assembled, focusing on trade as a means of promoting growth–a recommendation that is central to most donor support to African countries–does not appear to be a fruitful way of reducing Africa's marginalization in the world economy. That advice misconstrues the nature of the relationship between trade and growth while leaving intact many of the domestic distortions (such as the biases against agriculture) that have undermined both growth and trade in Africa. For policy makers, the message is clear. A growth-oriented program that explicitly removes the constraints on domestic economic activity will also stimulate trade.

References

Andriamananjara, S. and J. Nash (1997) "Have Trade Policy Reforms Led to Greater Openness in Developing Countries?" *Working Paper*, International Trade Division, The World Bank, Washington, D.C.

Arellano, M. and S. Bond (1991) "Some Tests of Specification for Panel Data: Monte Carlo Evidence and Application to Employment Equations" *Review of Economic Studies* Vol.58, pp.277-97.

Arellano, M. and S. Bond (1998) "Dynamic Panel Data Estimation Using DPD98 for GAUSS" Institute for Fiscal Studies, UK, February.

Barry, A. and N. Beltchika (1996) "Trends in African Trade" Paper prepared for Equity and Growth through Economic Research/Trade Regimes and Growth project, Associates for International Resources and Development, Cambridge.

Bhagwati, J. (1988) "Export-Promoting Trade Strategy: Issues and Evidence" *The World Bank Research Observer* Vol.3, No.1, pp.27-57.

Bloom, D. E. and J. D. Sachs (1998) "Geography, Demography, and Economic Growth in Africa" *Brookings Papers on Economic Activity* No.2, pp.207-295.

Blundell, R. and S. Bond (1998) "Initial Conditions and Moment Restictions in Dynamic Panel Data Models" *Journal of Econometrics* Vol.87, pp.115-43

Bouton, L., C. Jones, and M. Kiguel (1994) "Macroeconomic Reform and Growth in Africa: *Adjustment in Africa* Revisited" *Policy Research Working Paper* No.1394, December, The World Bank, Washington D.C.

Burnside, C. and D. Dollar (1997) "Aid, Policies, and Growth" *World Bank Working Paper* No.1777, June, The World Bank, Washington D.C.

Calamitsis, E. A., A. Basu, and D. Ghura (1999) "Adjustment and Growth in Sub-Saharan Africa" *Working Paper* No.51, African Department, International Monetary Fund, Washington D.C.

Caselli, F., G. Esquivel and F. Lefort (1996) "Reopening the Convergence Debate: A New Look at Cross-country Growth Empirics" *Journal of Economic Growth* No.1, pp.363-89.

Collier, P. (1991) "Africa's External Economic Relations: 1960-90" Ch. 6 in (ed.) D. Rimmer *Africa 30 Years On* London: The Royal Africa Society in association with James Currey

Collier, P. (1995) "The Marginalization of Africa" *International Labour Review* No.134, pp.541-57.

Collier, P. and J. W. Gunning (1999) "Explaining African Economic Performance" *Journal of Economic Literature* Vol. XXXVII, No.1, March, pp.64-111.

De Rosa, D. (1991) "Protection in Sub-Saharan Africa Hinders Exports" *Finance & Development* March, pp.42-45.

Dollar, D. (1992) "Outward-oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDC's 1976-1985" *Economic Development and Cultural Change* Vol.40, No.3, April, pp.523-544.

Duesenberry, J. S., A. A. Goldsmith, and M. F. McPherson (1999) "Restarting and Sustaining Growth and Development in Africa" *Development Discussion Papers Series* No.680, Harvard Institute for International Development, February

Easterly, W. and R. Levine (1995) "Africa's Growth Tragedy A Retrospective, 1960-89" *Policy Research Working Paper* No.1503, August, The World Bank, Washington D.C.

Edwards, S. (1993) "Openness, Trade Liberalization, and Growth in Developing Countries" *Journal of Economic Literature* Vol.31, No.3, September, pp.1355-1393.

Edwards, S. (1997) "Openness, Productivity and Growth: What Do We Really Know?" *Working Paper* No.5978, March, NBER, Cambridge, MA.

Engel, K. (1996) "Lessons from East Asia for Promoting Trade in Africa" Paper prepared for EAGER/Trade Regimes and Growth, USAID, April

Frankel, J. A. and D. Romer (1999) "Does Trade Cause Growth?" *The American Economic Review* June, pp.379-399.

Freeman, R. B. and D. L. Lindauer (1999) "Why Not Africa?" NBER *Working Paper* No.6942, February

Frimpong-Ansah, J. H., S. M. Ravi Kanbur, and P. Svedberg (eds.) (1991) *Trade and Development in Sub-Saharan Africa* New York: Manchester University Press

Ghura, D. and M. T. Hadjimichael (1996) "Growth in Sub-Saharan Africa" *IMF Staff Papers* Vol.43, No.3, September, pp.605-634.

Gillis, S.M, *et al.* (1996) *Economics of Development* Fourth Edition New York: W.W. Norton & Co.

Gyimah-Brempong, K. and T. L. Traynor (1999) "Political Instability, Investment and Economic Growth in Sub-Saharan Africa" *Journal of African Economies* Vol.8, No.1, pp.52-86.

Hansen, H. and F. Tarp (1999) "Aid Effectiveness Disputed", draft Development Economic Research Group (DERG), Denmark
Harrison, A. (1996) "Openness and Growth: A Time-Series, Cross-Country Analysis for Developing Countries" *Journal of Development Economics* March
Hoeffler, A. E. (1999) "The Augmented Solow Model and the African Growth Debate" University of Oxford: Centre for the Study of African Economies, March
Krueger, A. O. (1997) "Trade Policy and Economic Development: How We Learn" *Amercian Economic Review* Vol.87, No.1, March, pp.1-22.
Lindauer, D. and M. Roemer (eds.) (1994) *Asia and Africa Legacies and Opportunities in Development* San Francisco: ICS Press
McPherson, M. and C. S. Gray (2000) "An 'Aid Exit' Strategy for African Countries: A Debate" Paper prepared for the Equity and Growth through Economic Research Project, Harvard Institute for International Development, April
Michaely, M., D. Papageorgiou, and A. M. Choksi (eds.) (1991) *Liberalizing Foreign Trade (Volume 7): Lessons of Experience in the Developing World* Cambridge MA and Oxford: Basil Blackwell
Myint, Hla (1979) "Exports and Economic Development of Less Developed Countries" Reprinted in (eds.) C.K. Eicher and J.M. Staatz *Agricultural Development in the Third World* Baltimore: The Johns Hopkins University Press, 1984
Nash, J. (1993) "Implementation of Trade Reform in Sub-Saharan Africa: How Much Heat and How Much Light?" *Policy Research Working Paper* No.1218, The World Bank, Washington D.C.
Ndulu, B. and N. van de Walle (1996) *Agenda for Africa's Economic Renewal*Overseas Development Council, Washington D.C.
Ndulu, B. and Njuguna Ndung'u (1998) "Trade and Growth in Sub-Saharan Africa" Ch.9 in (eds.) Zubair Iqbal and Mohsin Khan *Trade Reform and Regional Integration in Africa* IMF Institute, International Monetary Fund, Washington D.C.
Ndulu, B. and S. O'Connell (1999) "Africa's Growth Experience: A Focus on Sources of Growth" draft paper presented at the AERC/Harvard Conference on African Economic Growth, March, Cambridge
OECD (1998) Open Markets Matter: The Benefits of Trade and Investment Liberalization Paris: Organization for Cooperation and Development
Onafowora, O. A. and O. Owoye (1998) "Can Trade Liberalization Stimulate Economic Growth in Africa?" *World Development* Vol.26, No.3, March, pp.497-506.
Rodrik, D. (1998) "Trade Policy and Economic Performance in Sub-Saharan Africa" NBER *Working Paper* No.6562, May
Roemer, M. (1994) "Industrial Strategies: Outward Bound" Ch. 7 in (eds.) D.L. Lindauer and M. Roemer *Asia and Africa Legacies and Opportunities in Development* San Francisco: International Center for Economic Growth
Sachs, J. D. (1996) "Growth in Africa: It can be done" *The Economist* June 29, pp.19-21.
Sachs, J. D. and A. M. Warner (1997) "Sources of Slow Growth in African Economies" *Journal of African Economies* Vol.6, No.3, pp.335-376.
Sharer, R. (1999) "Trade: An Engine of Growth for Africa" *Finance & Development* December, pp. 26-29
Svedberg, P. (1991) "The Export Performance of Sub-Saharan Africa" *Economic Development and Cultural Change* Vol.39, pp.549-564.
Temple, J. (1999) "The New Growth Evidence" *Journal of Economic Literature* Vol.XXXVII, March, pp.112-156.
Tybout, J. (2000) "Manufacturing Firms in Developing Countries: How Well Do They Do, and Why?" *Journal of Economic Literature*, vol.38, no.1, March, pp.11-44
WINROCK (1991) *African Development: Lessons from Asia* Arlington VA: Winrock Interational
World Bank (1994) *Adjustment in Africa: Reforms, Results and the Road Ahead* NewYork: Oxford University Press
Yeats, A. J., A. Amjadi, U. Reincke and Francis Ng (1996) "What Caused Sub-Saharan Africa's Marginalization in World Trade?" *Finance & Development* December, pp.38-41.
Yeats, A.J. *et al.* (1997) "Did Domestic Policies Marginalize Africa in International Trade?" *Directions in Development* The World Bank, Washington D.C.

Appendix

Figure 2. Sub-Saharan Africa: GDP per capita (in 1995 US Dollars), 1970-98

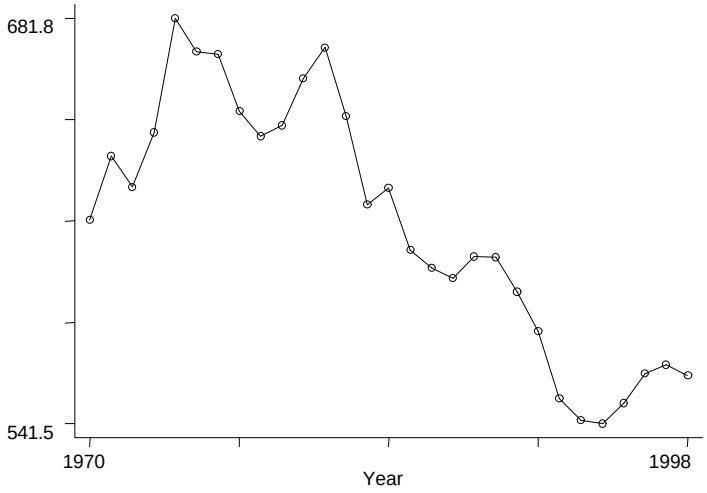


Figure 3. Sub-Saharan Africa: Trade share as percent of GDP, 1970-98

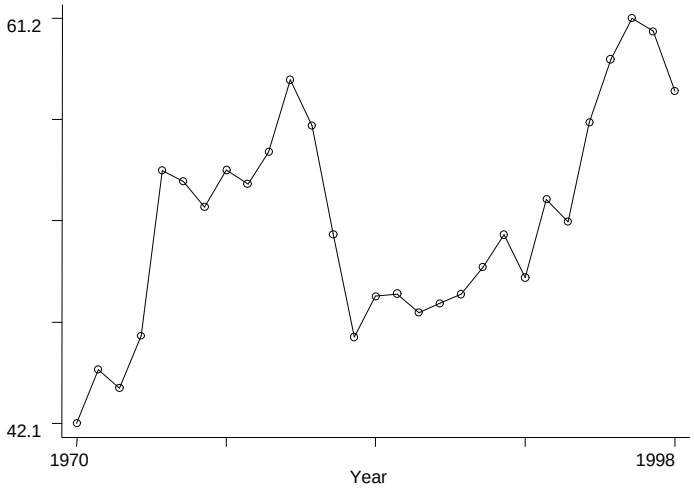


Table 7. Average Income Per Capita, Trade, Exports, Imports, and Net Exports in Sub-Saharan Africa, 1980-89

Country	GDP p.c. (1995 USD)	Trade	Exports	Imports	Net Exports
Gabon	4758	97	53	44	10
South Africa	4390	52	28	24	5
Botswana	2301	105	59	46	13
Mauritius	2207	112	55	58	-3
Swaziland	1120	155	71	84	-14
Congo, Rep.	992	105	52	53	-1
Côte d'Ivoire	914	71	37	34	3
Cameroon	898	53	26	26	0
Angola	680	60	35	26	9
Zimbabwe	666	44	21	22	-1
Senegal	571	69	29	41	-12
Mauritania	504	106	42	64	-21
Zambia	503	71	34	36	-2
Central African Rep.	399	53	20	33	-12
Togo	393	99	46	53	-7
The Gambia	379	109	48	61	-13
Benin	370	66	26	40	-14
Ghana	343	25	11	14	-3
Kenya	334	54	25	29	-4
Rwanda	317	31	10	21	-10
Lesotho	306	150	16	134	-119
Congo, Dem. Rep.	296	44	21	22	-1
Sierra Leone	295	28	12	17	-5
Madagascar	287	34	14	21	-7
Niger	271	50	21	29	-8
Mali	266	49	16	33	-18
Nigeria	245	42	21	20	1
Burkina Faso	224	41	10	31	-21
Guinea-Bissau	198	53	10	43	-33
Burundi	192	34	10	24	-13
Chad	187	44	15	29	-14
Malawi	155	55	24	31	-7
SSA	622	55	24	31	-8
World	4549	34	17	17	0

Note: Countries are listed in a descending order of their average income per capita for the decade. Trade (Exports plus Imports), Exports, Imports, and Net Exports are given in percent of GDP.

Table 8. Average Income Per Capita, Trade, Exports, Imports, and Net Exports in Sub-Saharan Africa, 1990-98

Country	GDP p.c. (1995 USD)	Trade	Exports	Imports	Net Exports
Gabon	4477	90	54	36	17
South Africa	3916	44	23	21	3
Mauritius	3440	127	61	66	-4
Botswana	3435	89	50	39	10
Namibia	2115	115	54	61	-7
Swaziland	1420	170	83	87	-4
Congo, Rep.	868	121	57	64	-7
Côte d'Ivoire	762	71	38	33	5
Zimbabwe	677	68	32	35	-3
Cameroon	654	42	23	19	3
Senegal	554	65	29	35	-6
Guinea	543	46	21	25	-4
Angola	526	116	59	57	2
Mauritania	453	97	43	54	-11
Lesotho	425	150	23	127	-104
Zambia	414	74	34	40	-6
Ghana	375	53	21	32	-11
Benin	365	58	25	33	-9
The Gambia	357	122	54	68	-15
Kenya	337	65	31	34	-3
Central African Rep.	335	42	17	25	-8
Togo	332	71	32	39	-7
Uganda	287	31	10	21	-12
Nigeria	258	77	41	36	5
Mali	254	55	20	35	-15
Madagascar	246	47	20	27	-8
Burkina Faso	241	39	12	27	-15
Rwanda	236	32	6	26	-20
Guinea-Bissau	226	49	12	37	-25
Chad	215	48	16	32	-16
Niger	214	38	16	22	-6
Sierra Leone	209	47	23	23	0
Burundi	176	33	9	24	-15
Tanzania	170	53	16	37	-20
Congo, Dem. Rep.	167	44	23	21	2
Malawi	154	63	25	38	-13
Mozambique	154	52	13	39	-26
Ethiopia	101	30	11	20	-9
SSA	560	56	27	29	-2
World	5065	42	21	21	0

Note: Countries are listed in a descending order of their average income per capita for the decade. Trade (Exports plus Imports), Exports, Imports, and Net Exports are given in percent of GDP.

Endnotes

[1] Trade is defined as the ratio of exports plus imports of goods and non-factor services to GDP. The data come from the World Bank Africa 2000 CD-ROM database.

[2] Many analyses focus on the advantages and drawbacks of different measures of openness. Edwards (1997) has a review. Sachs and Warner (1996) constructed an indicator of openness of an economy based on five (economic and institutional) criteria. A cross-section version of the indicator measures the proportion of years over a certain period when the country satisfies all five criteria (i.e., is considered 'open'). Leamer (1988) suggested an estimated measure of openness based on the average of residuals from a regression of the trade share on variables measuring size of the economy and distance to the nearest major trading center. Other studies have adopted a simpler approach by focusing on the trade dependency ratios, export growth, black market premiums on foreign exchange, or the average level of particular trade taxes as indicators of trade orientation. Each of these, of course, measures a different aspect of the commercial policy and puts the empirical results in a different context.

[3] Most analysts understand their approaches are subject to bias. Though, as noted in the text, they acknowledge the problem and move on. Calimitsis, Basu and Ghura (1999, p.10, n.13) are typical. They state that their approach can be criticized on statistical grounds. They explain that to check whether the bias is significant, they derived some single equation instrumental variable estimates (in their case using generalized least squares). They specifically note that the results of this exercise "show that, although the signs and magnitudes of the estimated coefficients were generally maintained, the statistical significance of the effects was considerably weaker." Undeterred by this finding, they base their conclusions on the original estimates.

[4] Frankel and Romer add some qualifications with respect to the robustness of this result when an attempt is made to account for regional differences across the world using continental dummies or distance to the equator. They also address the question of the limitations of the trade share as a proxy for all income-enhancing aspects of international exchange.

[5] Hoeffler has found that the Africa dummy in a cross-country growth regression is not significant. Her main conclusion is that (p.25):

> ….the augmented Solow model can fully account for sub-Saharan Africa's low growth performance provided we account for unobserved country specific effects and for the endogeneity of investment in [the] estimation.

[6] In some countries, it occurred earlier. Ghana, for example, had exhausted the "easy" phase of import substitution in the early 1960s. Its economy was already declining by the end of the 1960s.

[7] Data from World Bank CD-ROM *World Development Indicators* 2000 database.

[8] Rodrik (year and pagexxxx) argues that the many barriers to trade and exchange in Africa, although undoubtedly harmful to economic activity, have not suppressed the trade shares and have most probably "… operated by retarding income growth."

[9] Hansen and Tarp (1999) report "a robust aid-growth link even in countries hampered by an unfavorable policy environment."

[10] The convergence hypothesis is based on the idea that poorer countries typically have a smaller stock of physical and human capital. Accordingly, the marginal products of capital are higher in poor countries than in rich countries. Thus, for given levels of investment, the rate of growth in the poorer countries will be higher (Temple 1999:122-123).

[11] In the trade equation we also tested the effect of population growth–as a proxy for the size of economy-and the contemporaneous and lagged values of growth of investment. The coefficients of these variables were statistically insignificant and were dropped.

[12] The 33 countries in the sample used for the regression analysis are: Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Republic of Congo, Cote d'Ivoire, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia and Zimbabwe. The six countries that drop out are Angola, Benin, Chad, Democratic Republic of Congo, Equatorial Guinea, and Niger.

[13] First proposed by Arellano and Bond (1991), the dynamic panel GMM estimator was extended by Blundell and Bond (1998). The estimator is given as: $\delta = (X'ZA_NZ'X)^{-1}(X'ZA_NZ'y)$, where X and y are vectors of first differences of the regressors and the dependent variables, Z is the matrix of instruments, and A_N is a composite matrix of Z and a weighting matrix for the instruments.

[14] For the GMM estimation we have used the DPD98 GAUSS program by Arellano and Bond (1998).

[15] Preliminary results in the context of the above model reveal no substantive change in the conclusion regarding the direct effect of income growth and the indirect effects of the trade related variables. Indeed, the results show more subtlety in the effects of the exchange rate changes and a greater impact of import liberalization as opposed to an increase in exports. One explanation in an African context has been that many countries have more readily removed restrictions on exports than on imports. A further point is that because of acute foreign exchange constraints, the expansion of exports (which generates foreign exchange) has been far less severely constrained than the growth of imports which, in many countries, is restricted by foreign aid flows.

To Order EAGER Publications

EAGER Publications/BHM
P.O. Box 3415
Alexandria, Virginia 22302
Tel: (703) 299-0650 Fax: (703) 299-0651
e-mail: spriddy@eagerproject.com

EAGER Publications can be downloaded from www.eagerproject.com or through USAID's website at www.dec.org

Policy Briefs based on EAGER research funded by the U.S. Agency for International Development:

1. Can Mali Increase Red Meat Exports? Metzel, Jeffrey, Abou Doumbia, Lamissa Diakite, and N'Thio Alpha Diarra. *Prospects for Developing Malian Livestock Exports*. Cambridge, MA: Associates for International Resources and Development, 1997. Available in French.

2. The Livestock Sector in Mali - Potential for the Future. Metzel, Jeffrey, Abou Doumbia, Lamissa Diakite, and N'Thio Alpha Diarra. *Prospects for Developing Malian Livestock Exports.* Cambridge, MA: Associates for International Resources and Development, 1997. Available in French.

3. Mali's Manufacturing Sector: Policy Reform for Success. Cockburn, John, Eckhard Siggel, Massaoly Coulibaly, and Sylvain Vézina. *Manufacturing Competitiveness and the Structure of Incentives in Mali.* Cambridge, MA: Associates for International Resources and Development, 1997. Available in French.

4. Growth and Equity: Gemstone and Gold Mining in Tanzania. Phillips, Lucie Colvin, Rogers Sezinga, Haji Semboja, and Godius Kahyarara. *Gemstone and Gold Marketing for Small-Scale Mining in Tanzania.* Arlington, VA: International Business Initiatives, 1997. Available in French.

5. Financial Services and Poverty in Senegal. Ndour, Hamet, and Aziz Wané. *Financial Intermediation for the Poor*. Cambridge, MA: Harvard Institute for International Development, 1997. Available in French.

6. Need to Promote Exports of Malian Rice. Barry, Abdoul W., Salif B. Diarra, and Daouda Diarra. *Promotion of the Regional Export of Malian Rice.* Cambridge, MA: Associates for International Resources and Development, 1997. Available in French.

7. Trade Policy Reform: A Success? Metzel, Jeffrey, and Lucie C. Phillips. *Bringing Down Barriers to Trade: The Experience of Trade Policy Reform.* Cambridge, MA: Associates for International Resources and Development, 1997. Available in French.

8. Excise Taxes: A Greater Role in Sub-Saharan Africa? Bolnick, Bruce, and Jonathan Haughton. *Tax Policy in Sub-Saharan Africa: Reexamining the Role of Excise Taxation.* Cambridge, MA: Harvard Institute for International Development, 1997. Available in French.

9. Status of Financial Intermediation for the Poor in Africa. Nelson, Eric. *Financial Intermediation for the Poor: Survey of the State of the Art.* Bethesda, MD: Development Alternatives Incorporated, 1997. Available in French.

10. Foreign Direct Investment and Institutions. Wilhelms, Saskia K.S. *Foreign Direct Investment and Its Determinants in Emerging Economies*. Cambridge, MA: Associates for International Resources and Development, 1997. Available in French.

11. Strong Institutions Support Market-Oriented Policies. Goldsmith, Arthur. *Institutions and Economic Growth in Africa.* Cambridge, MA: Harvard Institute for International Development, 1997. Available in French.

12. Reducing Tax Evasion. Wadhawan, Satish, and Clive Gray. *Enhancing Transparency in Tax Administration: A Survey*. Cambridge, MA: Harvard Institute for International Development, 1997. Available in French.

13. Can Africa Take Lessons from the U.S. Approach to Tax Evasion? Gray, Clive. *Enhancing Transparency in Tax Administration: United States Practice in Estimating and Publicizing Tax Evasion.* Cambridge, MA: Harvard Institute for International Development, 1997. Available in French.

14. Estimating Tax Buoyancy, Elasticity and Stability. Haughton, Jonathan. *Estimating Tax Buoyancy, Elasticity, and Stability.* Cambridge, MA: Harvard Institute for International Development, 1997. Available in French.

15. Estimating Demand Curves for Goods Subject to Excise Taxes. Jonathan Haughton. *Estimating Demand Curves for Goods Subject to Excise Taxes.* Cambridge, MA: Harvard Institute for International Development, 1997. Available in French.

16. Fixed or Floating Exchange Rates? Amvouna, Anatolie Marie. *Determinants of Trade and Growth Performance in Africa: A Cross-Country Analysis of Fixed Versus Floating Exchange Rate Regimes.* Cambridge, MA: Associates for International Resources and Development, 1997. Available in French.

17. Trade and Development in Africa. Stryker, J. Dirck. *Trade and Development in Africa.* Cambridge, MA: Associates for International Resources and Development, 1997. Available in French.

18. Increasing Demand for Labor in South Africa. Stryker, J. Dirck, Fuad Cassim, Balakanapathy Rajaratnam, Haroon Bhorat, and Murray Leibbrandt. *Increasing Demand for Labor in South Africa.* Cambridge, MA: Associates for International Resources and Development, 1998.

19. Structural Adjustment: Implications for Trade. Barry, Abdoul W., B. Lynn Salinger, and Selina Pandolfi. *Sahelian West Africa: Impact of Structural Adjustment Programs on Agricultural Competitiveness and Regional Trade.* Cambridge, MA: Associates for International Resources and Development, 1998. Available in French.

20. The Uruguay Round: Impact on Africa. Hertel, Thomas W., William A. Masters, and Aziz Elbehri. *The Uruguay Round and Africa: A Global, General Equilibrium Analysis.* Cambridge, MA: Associates for International Resources and Development, 1998. Available in French.

21. Are Formal Trade Agreements the Right Strategy? Radelet, Steven. *Regional Integration and Cooperation in Sub-Saharan Africa: Are Formal Trade Agreements the Right Strategy?* Cambridge, MA: Harvard Institute for International Development, 1997.

22. Textiles in South Africa. Flaherty, Diane P., and B. Lynn Salinger. *Learning to Compete: Innovation and Gender in the South African Clothing Industry.* Cambridge, MA: Associates for International Resources and Development, 1998. Available in French.

23. Barriers to Business Expansion in a New Environment: *The Case of Senegal.* Beltchika-St. Juste, Ndaya, Mabousso Thiam, J. Dirck Stryker, with assistance from Pape Ibrahima Sow. *Barriers to Business Expansion in a New Environment: The Case of Senegal.* Cambridge, MA: Associates for International Resources and Development, 1999. Available in French.

24. Government and Bureaucracy. Goldsmith, Arthur. *Africa's Overgrown State Reconsidered: Bureaucracy and Economic Growth*. Cambridge, MA: Harvard Institute for International Development, 1998.

25. What Can We Do To Stop Smuggling in Tanzania? Phillips, Lucie Colvin, Rogers Sezinga, and Haji Semboja. Based on EAGER research in Tanzania on gold and gems marketing. Arlington, VA: International Business Initiatives, 1997.

26. Financial Programming in East and Southern Africa. Workshop held in Lilongwe, Malawi. June, 1999.

27. Restarting and Sustaining Growth and Development in Africa: A Framework for Action. Duesenberry, James S., Arthur A. Goldsmith, and Malcolm F. McPherson. *Restarting and Sustaining Growth and Development in Africa*. Cambridge, MA: Harvard Institute for International Development, 2000.

28. Restarting and Sustaining Growth and Development in Africa: Enhancing Productivity. Duesenberry, James S., Arthur A. Goldsmith, and Malcolm F. McPherson. *Restarting and Sustaining Growth and Development in Africa.* Cambridge, MA: Harvard Institute for International Development, 2000.

29. A Pragmatic Approach to Policy Change. Duesenberry, James S., and Malcolm F. McPherson. *Restarting and Sustaining Growth and Development in Africa: The Role of Macroeconomic Management.* Cambridge, MA: Harvard Institute for International Development, forthcoming in 2000.

30. Finance Capital and Real Resources. Duesenberry, James S., and Malcolm F. McPherson. *Restarting and Sustaining Growth and Development in Africa: The Role of Macroeconomic Management.* Cambridge, MA: Harvard Institute for International Development, forthcoming in 2000.

31. The Role of Central Bank Independence in Improved Macroeconomic Management. Duesenberry, James S., and Malcolm F. McPherson. *Restarting and Sustaining Growth and Development in Africa: The Role of Macroeconomic Management.* Cambridge, MA: Harvard Institute for International Development, forthcoming in 2000.

32. Governance and Macroeconomic Management. Duesenberry, James S., and Malcolm F. McPherson. *Restarting and Sustaining Growth and Development in Africa: The Role of Improved Macroeconomic Management.* Cambridge, MA: Harvard Institute for International Development, 2000.

33. The Benefits and Costs of Seignorage. McPherson, Malcolm F. *Seignorage in Highly Indebted Developing Countries.* Cambridge, MA: Harvard Institute for International Development, 2000.

35. Global Trade Analysis for Southern Africa. Masters, William A. Based on EAGER research in Southern Africa. West Lafayette, IN: Purdue University, 2000.

36. Modeling Long-Term Capacity Expansion Options for the Southern African Power Pool (SAPP). Sparrow, F. T., Brian H. Bowen, and Zuwei Yu. *Modeling Long-Term Capacity Expansion Options for the Southern African Power Pool (SAPP).* West Lafayette, IN: Purdue University, 1999.

38. Africa's Opportunities in the New Global Trading Scene. Salinger, B. Lynn, Anatolie Marie Amvouna, and Deirdre Murphy Savarese. *New Trade Opportunities for Africa*. Cambridge, MA: Associates for International Resources and Development, 1998. Available in French.

39. Implications for Africa of Initiatives by WTO, EU and US. Plunkett, Daniel. *Implications for Africa of Initiatives by WTO, EU and US.* Cambridge, MA: Associates for International Resources and Development, 1999.

40. Domestic Vanilla Marketing in Madagascar. Metzel, Jeffrey, Emilienne Raparson, Eric Thosun Mandrara. *The Case of Vanilla in Madagascar.* Cambridge, MA: Associates for International Resources and Development, 1999.

41. The Transformation of Microfinance in Kenya. Rosengard, Jay, Ashok S. Rai, Aleke Dondo, and Henry O. Oketch. *Microfinance Development in Kenya: Transforming K-Rep's Microenterprise Credit Program into a Commercial Bank.* Cambridge, MA: Harvard Institute for International Development, 1999.

42. Africans Trading with Africans: Cross-Border Trade – The Case of Ghana. Morris, Gayle A., and John Dadson. *Ghana: Cross Border Trade Issues.* Arlington, Virginia: International Business Initiatives, 2000.

43. Trade Liberalization and Growth in Kenya. Glenday, Graham, and T. C. I. Ryan. Based on EAGER Research. Cambridge, MA: Belfer Center for Science & International Affairs, 2000.

46. Labor Demand and Labor Productivity in Ghana. Gyan-Baffour, George, and Charles Betsey, in collaboration with Kwadwo Tutu and Kwabia Boateng. *Increasing Labor Demand and Labor Productivity in Ghana.* Cambridge, MA: Belfer Center for Science & International Affairs, 2000.

47. Foreign & Local Investment in East Africa. Phillips, Lucie C., Marios Obwona, Margaret McMillan, with Aloys B. Ayako. *Foreign and Local Investment In East Africa, Interactions and Policy Implications: Case Studies on Mauritius, Uganda and Kenya*. Arlington, Virginia: International Business Initiatives, 2000.

48. Does it pay to court foreign investment? Phillips, Lucie C., Marios Obwona, Margaret McMillan, with Aloys B. Ayako. *Foreign and Local Investment in East Africa: Interactions and Policy Implications*. Arlington, Virginia: International Business Initiatives, 2000.

49. Ethnicity & Investment Promotion: A Thorny Path for Policy Makers. Phillips, Lucie C., Marios Obwona, Margaret McMillan, with Aloys B. Ayako. *Foreign and Local Investment in East Africa: Interactions and Policy Implications*. Arlington, Virginia: International Business Initiatives, 2000.

50. Monetary and Exchange Rate Policy in Uganda. Musinguzi, Polycarp, with Marios Obwona, and J. Dirck Stryker. *Monetary and Exchange Rate Policy in Uganda*. Cambridge, MA: Associates for International Resources and Development, 2000.

55. The Impact of Policy Reforms on Bank Efficiency and Savings Mobilization in Ghana. Ziorklui, Sam, in collaboration with Philip Fanara, Jr., Charlie Mahone, C.W.K. Ahiakpor, Fritz Gockel, Sam Mensah, Steven Ameyaw, and Anthony Doku. *The Impact of Financial Sector Reform on Bank Efficiency and Financial Deepening for Savings Mobilization in Ghana*. Washington, DC: Howard University, 2001.

56. Constraints to Capital Market Development and Growth in Sub-Saharan Africa: The Case of Tanzania. Ziorklui, Sam, in collaboration with Lemma W. Senbet, Abdiel G. Abayo, Flora Musonda, Bartholomew Nyagetera, Longinus Rutasitara, and Gabriel D. Kitua. *Capital Market Development and Growth in Sub-Saharan Africa: The Case of Tanzania*. Washington, DC: Howard University, 2001.

57. Constraints to Capital Market Development and Growth in Sub-Saharan Africa: The Case of Ghana. Ziorklui, Sam, in collaboration with Lemma W. Senbet, Philip Fanara, Jr., William Barbee, Jr., Kofi Osei, Fritz Gockel, John Kwakye, John Aheto, Ekow Afedzie, and Anthony Doku. *The Development of Capital Markets and Growth in Sub-Saharan Africa: The Case of Ghana*. Washington, DC: Howard University, 2001.

58. Contract Enforcement. Kähkönen, Satu and Patrick Meagher. *Contract Enforcement and Economic Performance*. College Park, Maryland: IRIS, 1998.

African Economic Policy Discussion Papers

1. Kähkönen, S., and P. Meagher. July 1998. *Contract Enforcement and Economic Performance.* Available in French.

2. Bolnick, B., and J. Haughton. July 1998. *Tax Policy in Sub-Saharan Africa: Examining the Role of Excise Taxation.* Available in French.

3. Wadhawan, S. C., and C. Gray. July 1998. *Enhancing Transparency in Tax Administration: A Survey.* Available in French.

4. Phillips, L. C. July 1998. *The Political Economy of Policy Making in Africa.*

5. Metzel, J., and L. C. Phillips. July 1998. *Bringing Down Barriers to Trade: The Experience of Trade Policy Reform.* Available in French.

6. Salinger, B. L., A. M. Amvouna, and D. M. Savarese. July 1998. *New Trade Opportunities for Africa.* Available in French.

7. Goldsmith, Arthur. July 1998. *Institutions and Economic Growth in Africa.* Available in French.

8. Flaherty, D. P., and B. L. Salinger. July 1998. *Learning to Compete: Innovation and Gender in the South African Clothing Industry.*

9. Wilhelms, S. K. S. July 1998. *Foreign Direct Investment and Its Determinants in Emerging Economies.* Available in French.

10. Nelson, E. R. August 1998. *Financial Intermediation for the Poor: Survey of the State of the Art.* Available in French.

11. Haughton, J. August 1998. *Estimating Tax Buoyancy, Elasticity, and Stability.*

12. Haughton, J. August 1998. *Estimating Demand Curves for Goods Subject to Excise Taxes.*

13. Haughton, J. August 1998. *Calculating the Revenue-Maximizing Excise Tax.*

14. Haughton, J. August 1998. *Measuring the Compliance Cost of Excise Taxation.*

15. Gray, C. August 1998. *United States Practice in Estimating and Publicizing Tax Evasion.*

16. Cockburn, J., E. Siggel, M. Coulibaly, and S. Vézina. August 1998. *Measuring Competitiveness and its Sources: The Case of Mali's Manufacturing Sector.* Available in French.

17. Barry, A. W., S. B. Diarra, and D. Diarra. April 1999. *Promotion of Regional Exports of Malian Rice.* Available in French.

18. Amvouna, A. M. July 1998. *Determinants of Trade and Growth Performance in Africa: A Cross-Country Analysis of Fixed verus Floating Exchange Rate Regimes.* Available in French.

19. Stryker, J. D. June 1999. *Dollarization and Its Implications in Ghana.* Available in French.

20. Radelet, S. July 1999. *Regional Integration and Cooperation in Sub-Saharan Africa: Are Formal Trade Agreements the Right Strategy?*

21. Plunkett, D. J. September 1999. *Implications for Africa of Initiatives by the WTO, EU and US.*

22. Morris, G. A. and J. Dadson. March 2000. *Ghana: Cross-Border Trade Issues.*

23. Musinguzi, P., with M. Obwona and J. D. Stryker. April 2000. *Monetary and Exchange Rate Policy in Uganda.*

24. Siggel, E., and G. Ssemogerere. June 2000. *Uganda's Policy Reforms, Industry Competitiveness and Regional Integration: A comparison with Kenya.*

25. Siggel, E., G. Ikiara, and B. Nganda. June 2000. *Policy Reforms, Competitiveness and Prospects of Kenya's Manufacturing Industries: 1984-1997 and Comparisons with Uganda.*

26. McPherson, M. F. July 2000. *Strategic Issues in Infrastructure and Trade Policy.*

27. Sparrow, F. T., B. H. Bowen, and Z. Yu. July 1999. *Modeling Long-Term Capacity Expansion Options for the Southern African Power Pool (SAPP).* Available in French.

28. Goldsmith, A., M. F. McPherson, and J. Duesenberry. January 2000. *Restarting and Sustaining Growth and Development in Africa.*

29. Gray, C., and M. F. McPherson. January 2000. *The Leadership Factor in African Policy Reform and Growth.*

30. Masters, W. A., R. Davies, and T. W. Hertel. November 1998 revised June 1999. *Europe, South Africa, and Southern Africa: Regional Integration in a Global Context.* Available in French.

31. Beltchika-St. Juste, N., M. Thiam, J. D. Stryker, with assistance from P. I. Sow. 1999. *Barriers to Business Expansion in a New Environment: The Case of Senegal.* Available in French.

32. Salinger, B. L., D. P. Flaherty, and M. Keswell. September 1999. *Promoting the Competitiveness of Textiles and Clothing Manufacture in South Africa.*

33. Block, S. A. August 1999. *Does Africa Grow Differently?*

34. McPherson, M. F. and T. Rakovski. January 2000. *A Small Econometric Model of the Zambian Economy.*

37. Barry, A. W., Salinger, B. L., and S. Pandolfi. December 2000. *Sahelian West Africa: Impact of Structural Adjustment Programs on Agricultural Competitiveness and Regional Trade*.

38. Plunkett, D. J. May 2001. *Policy Challenges in the West Africa Electricity Project*. Available in French.

40. Bräutigam, D. July 2000. *Interest Groups, Economic Policy, and Growth in Sub-Saharan Africa*.

42. Duesenberry, J. S., and M. F. McPherson. March 2001. *Financial Reform as a Component of a Growth-Oriented Strategy in Africa*.

43. Glenday, G., and D. Ndii. July 2000. *Export Platforms in Kenya*.

44. Glenday, G. July 2000. *Trade Liberalization and Customs Revenues: Does trade liberalization lead to lower customs revenues? The Case of Kenya*.

45. Goldsmith, A. May 2001. *Africa's Overgrown State Reconsidered: Bureaucracy and Economic Growth.*

46. Goldsmith, A. June 2000. *Risk, Rule, and Reason in Africa*.

47. Goldsmith, A. June 2000. *Foreign Aid and Statehood in Africa*.

48. Goldsmith, A. May 2001. *Sizing up the African State: Two Types of Government Errors*.

49. McPherson, M. F., and C. Gray. July 2000. *An 'Aid Exit' Strategy for African Countries: A Debate*.

50. Gyan-Baffour, G. and C. Betsey, with K. Tutu and K. Boateng. February 2001. *Increasing Labor Demand and Labor Productivity in Ghana*.

51. Isimbabi, M. J. December 2000. *Globalization and the WTO Agreement on Financial Services in African Countries*.

52. Duesenberry, J. S. and M. F. McPherson. April 2001. *Restarting and Sustaining Growth and Development in Africa: The Macroeconomic Dimension.*

53. McPherson, M. F., and C. B. Hill. June 2000. *Economic Growth and Development in Zambia: The Way Forward*.

54. McPherson, M. F., and T. Rakovski. March 2001. *Understanding the Growth Process in Sub-Saharan Africa: Some Empirical Estimates*.

56. McPherson, M. F., and T. Rakovski. July 2000. *Exchange Rates and Economic Growth in Kenya: An Econometric Analysis*.

57. McPherson, M. F. July 2000. *Exchange Rates and Economic Growth in Kenya*.

58. McPherson, M. F. July 2000. *Seignorage in Highly Indebted Developing Countries*.

59. McCulloch, R., and M. F. McPherson. March 2001. *Promoting and Sustaining Trade and Exchange Reform in Africa: An Analytical Framework.*

60. McPherson, M. F. March 2001. *Growth and Poverty Reduction in Mozambique: A Framework for Analysis*.

62. McPherson, M. F. March 2001. *Restarting and Sustaining Growth and Development in Africa: A Framework for Improving Productivity*.

64. McPherson, M. F., and T. Rakovski. May 2001. *Trade and Growth in Sub-Saharan Africa: Further Empirical Evidence*.

65. Duesenberry, J. S., C. S. Gray, and M. F. McPherson. May 2001. *Alternative Exchange Rate Regimes for Sub-Saharan Africa*.

66. McPherson, M. F. May 2001. *Sustaining Trade and Exchange Rate Reform in Africa: Lessons for Macroeconomic Management*.

67. Phillips, L. C., M. Obwona, M. McMillan, with A. B. Ayako. December 2000. *Foreign and Local Investment in East Africa: Interactions and Policy Implications*.

68. Phillips, L. C., H. Semboja, G. P. Shukla, R. Sezinga, W. Mutagwaba, B. Mchwampaka, with G. Wanga, G. Kahyarara, and P. C. Keller. March 2001. *Tanzania's Precious Minerals Boom: Issues in Mining and Marketing*.

69. Rosen, S., and J. R. Vincent. May 2001. *Household Water Resources and Rural Productivity in Sub-Saharan Africa: A Review of the Evidence*.

70. Rosengard, J. K., A. S. Rai, A. Dondo, and H. O. Oketch. June 2001. *Microfinance Development in Kenya: Transforming K-Rep's Microenterprise Credit Program into a Commercial Bank.*

71. Shekidele, C. M. S. June 2001. *Report of a Study on Measuring the Compliance Costs of Taxation: Excise Duties 1995-96*.

72. Osoro, N., P. Mpango, and H. Mwinyimvua. June 2001. *An Analysis of Excise Taxation in Tanzania*.

73. Okello, A. K. June 2001. *An Analysis of Excise Taxation in Kenya*.

74. Terkper, S. E. June 2001. *The Role of Excise Taxes in Revenue Generation in Ghana*.

79. Ziorklui, S. Q. in collaboration with L. W. Senbet, A. G. Abayo, F. Musonda, B. Nyagetera, L. Rutasitara, and G. D. Kitua. February 2001. *Capital Market Development and Growth in Sub-Saharan Africa: The Case of Tanzania*.

80. Ziorklui, S. Q. in collaboration with L. W. Senbet, P. Fanara, Jr., W. Barbee, Jr., K. Osei, F. Gockel, J. Kwakye, J. Aheto, E. Afedzie, and A. Doku. February 2001. *The Development of Capital Markets and Growth in Sub-Saharan Africa: The Case of Ghana*.

81. Ziorklui, S. Q. in collaboration with F. Gockel, P. Fanara, Jr., C. Mahone, C.W.K. Ahiakpor, S. Mensah, S. Ameyaw, and A. Doku. February 2001. *The Impact of Financial Sector Reform on Bank Efficiency and Financial Deepening for Savings Mobilization in Ghana*.

EAGER Research Reports

Cockburn, John, E. Siggel, M. Coulibaly, and S. Vézina. October 1998. *Measuring Competitiveness and its Sources: The Case of Mali's Manufacturing Sector*. Available in French.

McEwan, Tom et al. *A Report on Six Studies of Small, Medium and Micro Enterprise Developments in Kwazulu-Natal.*

McPherson, Malcolm F. *Sustaining Trade and Exchange Rate Reform in Africa: Lessons for Macroeconomic Management.*

Metzel, Jeffrey, A. Doumbia, L. Diakite, and N. A. Diarra. July 1998. *Prospects for Developing Malian Red Meat and Livestock Exports.* Available in French.

Phillips, Lucie C., M. Obwona, M. McMillan, with A. B. Ayako. December 2000. *Foreign and Local Investment In East Africa, Interactions and Policy Implications: Case Studies on Mauritius, Uganda and Kenya*.

Phillips, Lucie C., H. Semboja, G. P. Shukla, R. Sezinga, W. Mutagwaba, B. Mchwampaka, with G. Wanga, G. Kahyarara, and P. C. Keller. March 2001. *Tanzania's Precious Minerals Boom: Issues in Mining and Marketing*.

Salinger, Lynn B., H. Bhorat, D. P. Flaherty, and M. Keswell. August 1999. *Promoting the Competitiveness of Textiles and Clothing Manufacture in South Africa.*

Sparrow, F. T., and B. H. Bowen. July 1999. *Modeling Electricity Trade in South Africa: User Manual for the Long-Term Model*.

Sparrow, F. T., B. H. Bowen, and D. J. Plunkett. May 2001. *General Training Manual for the Long-Term Planning Model*. Available in French.

Other Publications

McPherson, Malcolm F., and Arthur Goldsmith. Summer-Fall 1998. Africa: On the Move? *SAIS Review, A Journal of International Affairs*, The Paul H. Nitze School of Advanced International Studies, The John Hopkins University, Volume XVIII, Number Two, p. 153.

EAGER All Africa Conference Proceedings. October 18-20, 1999.

EAGER Regional Workshop Proceedings on the Implementation of Financial Programming. Lilongwe, Malawi. June 10-11, 1999.

EAGER Workshop Proceedings Senegal. November 4-6, 1998.

EAGER Workshop Proceedings South Africa. February 4-6, 1998.

EAGER Workshop Proceedings Tanzania. August 13-16, 1997.

EAGER Workshop Proceedings Ghana. February 5-8, 1997.

EAGER Workshop Proceedings. Howard University. July 17-19, 1996.

EAGER Workshop Proceedings Uganda. June 19-22, 1996.